Remarks

Claims 1-9 are pending in the application. Claims 1-6 are rejected. Claims 7-9 are objected to. Claim 1 is amended. No new subject matter is added.

Claim 1 is amended to clarify that the average total distortion including spatial distortion of coded objects is based on the quantizer parameter, and spatial and temporal distortion of uncoded objects is based on the quantizer parameter and the skip parameter.

It would be readily understood by a person of ordinary skill in the art that removing noise or distortion from a video by filtering as in Walker is an operation that alters, e.g., according to a set of filter coefficients, the video signal to be coded. Determining the average total distortion as claimed is a measure or estimate of distortion that is ***expected to occur*** for a selected quantization parameter and skip parameter. This dependency is readily understood by those of ordinary skill in the art, and is clearly disclosed in the specification, "The spatial distortion 211 is dependent on the quantizer parameter Q, a spatial measure, while the temporal distortion 221 depends on both the quantizer and skip parameters." The applicant's clarify this in the present amendment of claim 1.

Further, the arguments in response to the first office action dated July 16, 2004, are incorporated herein and re-stated below.

In paragraphs 3-4, claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walker (U.S. Patent 6,222,881).

The invention encodes a video as video objects. For each candidate object, a quantizer parameter and a skip parameter that jointly minimizes an average total distortion in the video are determined while satisfying predetermined constraints. The average total distortion includes spatial distortion of coded objects and spatial and temporal distortion of uncoded objects. Then, the candidate object is encoded as the coded object with the quantizer parameter and the skip parameter, and the candidate object is skipped as the uncoded objects with the skip parameter.

In paragraph 4 the Examiner admits, "Walker fails to use the term distortion." However, the Examiner then erroneously asserts "Walker does disclose using an equivalent term in complexity," and "complexity and distortion can be used interchangeably." It is respectfully submitted that the Examiner's assertions are wrong.

In the ordinary dictionary (Merriam-Webser) meanings 'distortion' in a "video signal is caused by a *change* in the wave form of the original signal," and complexity is " the quality or state of being complex."

In other words, distorting is a measure of *difference* between two signals, and complexity is an measure of *absolute* complication in a single signal. These meanings are **not** equivalent.

It should be understood that a complex signal may very well be undistorted. There is no requirement that a complex signal must be distorted, as the examiner requires.

Similarly, an undistorted signal can be complex. Distortion and complexity relate to different measurable qualities in signals. Complexity deals with a single signal, while distortion requires a difference of two signals.

In Walker (col. 17, lines 5-10), the complexity measure is described as a function of a single input signal data to be encoded. "*Where a region corresponds to a block of the video frame, the complexity measure is preferably a weighted sum of the absolute values of the DCT coefficients for that block.*" There, complexity is determined based on a region of a frame that has not been encoded, and a quantization level for encoding the frame is selected based on the determined complexity. There is no description of minimizing total average distortion as claimed.

A person of ordinary skill in the art would never confuse the meanings of the word complexity, as described by Walker, with the word distortion, which is well known in the art as a function of a ***difference*** between an original signal and a reconstructed signal. The Examiner is requested to review the section of the specification titled "Determining Distortion" beginning at page 6. See also see US Patent 6,671,324, issued on December 30 2003 to Vetro, et al., co-filed and incorporated by reference with the present application. Distortion should never be confused with complexity. Therefore, because the Examiner's rejection is entirely based on an incorrect definition of distortion, the rejection should be withdrawn.

Further, claimed is determining, for each candidate object, a quantizer parameter and a skip parameter that ***jointly*** minimizes an average total distortion in the video while satisfying predetermined constraints. Walker determines a block to be skipped based on the quantized differences between a block of the current frame

and a corresponding block *in a previous frame* (col 6, ln 46-50). The decision to skip a block is made first and independent of a target bit-rate. Then, ***for the remaining blocks to be encoded***, i.e., those blocks that have not been skipped, a quantization level is determined based on a complexity measure. Thus, Walker does not describe determining the quantization parameter and skip parameter that *jointly* minimize an average *distortion* according to the present invention. As stated above, Walker determines blocks to be skipped, then determines complexity of the remaining blocks and selects a quantization parameter based on the complexity. Walker never selects a quantizer parameter and a skip parameter that jointly minimizes a total average distortion as claimed.

Further, the claimed average total distortion includes spatial distortion of coded objects and spatial and temporal distortion of uncoded objects. The Examiner points to Figure 8 of Walker, which illustrates an optional, pre-processing, filtering step (406 of Figure 4) to filter noise from the subsampled signal. The Examiner is requested to explain how pre-filtering a subsampled signal describes an average total distortion including spatial distortion of ***coded*** objects and spatial and temporal distortion of ***uncoded*** objects as claimed. The Examiner's reference to filtering step (406) makes no sense.

Claims 2-6 and 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walker, in view of Ito, et al., (U.S. 6,377,309 – "Ito").

Ito describes a method for detecting MPEG-4 data inserted into an MPEG-2 data stream.

In claim 2, the object is a video object plane (VOP) having an arbitrary shape and size. The object is encoded with the quantizer parameter and the skip parameter that jointly minimizes an average total distortion in the video. Ito describes VOPs, which are known. Ito never describes determining a quantizer parameter and a skip parameter that jointly minimizes an average total distortion as claimed. Walker determines a quantization parameter based on complexity. The quantization parameter is disjoint from the skip parameter in Walker. Walker never describes minimizing total average distortion. Accordingly, the applied combination of art fails to teach or suggest encoding a video object plane having an arbitrary shape and size with a quantization parameter and a skip parameter that jointly minimizes an average total distortion in the video as claimed.

In claim 3, the object is a video frame having a rectangular shape and fixed size. As stated above with respect to claim 1, Walker determines a quantization parameter based on a complexity measure. Complexity is not distortion. Walker never describes reducing total average distortion as claimed.

In claim 4, the skip parameter is f_s, and $(f_s - 1)$ uncoded objects are skipped. Walker determines a skipped block based on a sum of absolute coefficient differences compared to a threshold. Walker fails to teach the skip parameter as claimed.

In claim 5, multiple candidate objects are encoded concurrently, each is encoded with a quantizer parameter and a skip parameter that jointly minimizes an average total distortion in the video. As stated above, neither Ito nor Walker describes encoding with a quantizer parameter and a skip parameter that jointly minimizes an average total distortion.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walker in view of Sethuraman, et al., (U.S. 6,526,097 – "Sethuranam").

Sethuraman describes controlling a frame rate by skipping frames based on a target bit rate. Sethunaram fails to cure the defects of Walker. Sethunaram never teaches a skip parameter and a quantizer parameter jointly minimizes an average total distortion in the video as claimed.

Sethuraman decides to skip frames based on a target bit rate only. Walker determines a quantizer parameter based on block complexity. Neither Walker nor Sethunaram, alone or in combination, minimize a total average distortion as claimed. Accordingly, the combination of Walker and Sethuraman fails to teach or suggest encoding a video object with a quantization parameter and a skip parameter that ***jointly*** minimizes an average total distortion in the video, where an average skip parameter is $\overline{f}_s = \frac{F_{src}}{\overline{F}}$, where F_{src} is a source frame-rate, and $\overline{F}$ is an average coded frame rate as claimed.

All rejections have been complied with, and applicant respectfully submits that the application is now in condition for allowance. The applicant urges the Examiner to contact the applicant's attorney at the phone and address indicated below if assistance is required to move the present application to allowance.

Please charge any shortages in fees in connection with this filing to Deposit Account 50-0749.

Respectfully submitted,
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